# REMARKS

The Examiner has rejected claims 1, 3-14, 16, 17-19, 25, 28-60, and 62 as being obvious over Hamilton in view of Green.

As to claims 1, 7, 16, 17, 25 and 62, Hamilton discloses a method of applying a material to soil (col. 4, lines 32-41 and col. 5 lines 43-46) comprising adding the material to the solid carrier (Col. 5 lines 43-46); that are pellets and a fibrous material (col. 4 lines 5-42; col. 5 lines 43-46); applying the soil carrier to the soil (col. 4 lines 35-41); applying water to the solid carrier ("when wetted" of col. 4 lines 32-41); releasing the material out of the carrier and into the soil ("disintegrate when wetted" of col. 4 lines 32-41); wherein the soil carrier is made by an agglomeration process, pressure ("water is extruded and lost during pelletization" of col. 4 lines 14-17); wherein application rates of the solid carrier to the soil is based on the desired amount of material to be metered to the soil ("uniform incorporation of small amounts of powdered water-absorbing, gel-forming polymers", col. 4 lines 32-41). Not disclosed is the material being a soil stabilizer. Green discloses a soil stabilizer, anionic PAM, to the soil (abstract). It would have been obvious to modify the method of Hamilton by using PAM as the agent as disclosed by Green, so as to stabilize soil aggregation and flocculate suspended particles (abstract of Green) so as to stop erosion.

Hamilton relates to a process for producing mulching pellets from waste paper scrap by incorporating particulate water-insoluble, swellable, gel-forming polymer into the pellet forming composition. The formed pellets swell and disintegrate after being impregnated with water, to increase their area of ground coverage (Abstract). As stated in the Abstract, the polymer is a cross-linked polymer which is not water soluble and the polymer would not go into the soil because it is a copolymer. The background of the invention of Hamilton discusses mulching and the effective ways for using a mulch. The prior art referenced by Hamilton relates to the use of straw or a hydro-mulch. In the Summary of the Invention of Hamilton, the invention is again described as mulching pellets containing waste paper and a swelling agent. The summary describes the mulch as providing a surface covering which is a blanket to maintain moisture in the soil. The pellets come apart to create a greater surface area of the mulch. The second paragraph of Hamilton describes that the most essential feature of the process and mulch pellets is the incorporation of a swelling agent comprising a water insoluble material.

Again in the Detailed Description of the Invention on Col. 2, line 63, the swelling agent is described as being water insoluble. Again, in col. 3, the invention is described as overcoming the problems of the prior art by using a water insoluble polymer. In col. 3, lines 34-38, Hamilton describes the essential additive to the paper being the water insoluble material. In col. 3, lines 43-54, Hamilton specifically references a cross linked polyacrylamide polymer, "P4". Hamilton states that these cross linked polymers are used in diapers and related polymers.

Hamilton discloses a reference U.S. Patent 3,973,355 to disclose the incorporation of water soluble cross-linked polymers. That reference specifically discloses a water insoluble cross-linked polymer. Further, that reference in Col. 6, lines 3-7 states that water soluble polymers cannot be used. Col. 4, lines 32-41 describes the mulch properties as being able to spread or broadcast over the soil the pellets.

Green describes in the Abstract the problems of soil degradation and the use of water-soluble PAM as a soil conditioner to stabilize soil aggregates as well as flocculate suspended particles. Green describes that the focus of PAM in his paper is for use in furrow irrigation, rain-fed or sprinkler irrigation, and disturbed lands, including construction, Col. 2, pg. 1. In Col. 3, Green describes polyacrylamide as a water-soluble polymer. Green further describes that it is the ionic charge properties of this particular PAM which play an integral role in its adsorption to the soil. On page 5, Green describes that mulch application is not a good alternative in many cases and that they are generally ineffective once rills form. Green describes polyacrylamide as an alternative to mulch and not in conjunction with mulch.

Applicant encloses the Declaration of Michael Krysiak. Mr. Kryisak is currently the president and CEO of Encap. Declaration, paragraph 4. Mr. Krysiak has reviewed the present application, the Hamilton application and the Green reference. Declaration, paragraph 6.

The Green reference discusses the use of a water soluble PAM for use in furrow irrigation, rain-fed or sprinkler irrigation and construction. (Declaration, paragraph 7).

Hamilton teaches pelletization of a fibrous material so as to have a granular mulch. The product and process of the Hamilton invention is intended to create a pellet mulch that swells, expands, and disintegrate for the purpose to increase the pellet's area of ground cover. With this ground covering comes the benefits of the pellet mulch's ability to absorb water, prevents water run-off, and helps maintain moisture in the soil. This is accomplished through the use of water-insoluble, swellable, gel-forming, hydrophilic polymeric materials, capable of absorbing substantial amounts of water. As these water-insoluble materials swell, the pellet mulch materials expand to cover a larger surface area. (Declaration, paragraph 8).

The PAM CARRIER of the present invention is designed to be a delivery system of a water soluble polymer to the soil. Once the PAM CARRIER is metered to the ground/soil, the polymer is "watered out" to the soil as water comes in contact with the carrier. The polymer being release from the PAM CARRIER then conditions the soil. This conditioning enables the soil to better aid in germination and/or erosion control. (Declaration, paragraph 9).

Hamilton at col. 2 lines 44-49 states that the most essential feature of the invention is the incorporation of a water-insoluble polymeric material. (Declaration, paragraph 10).

The Hamilton patent is distinctively different than the present invention. Hamilton teaches use of a water holding/swelling polymer, as opposed to the present invention's use of a water soluble polymer. The intended purposes of each polymer are as different as the polymer chemistry themselves. Hamilton's intent is water holding. The present invention relates to nutrient management. (Declaration, paragraph 11).

After reviewing both Hamilton and Green, I do not believe that one skilled in the art would combine the references and in fact I believe that the references teach two different polyacrylamides, water soluble for Green and water insoluble for Hamilton. I further believe that the references teach against using other types of PAM for their specific uses. (Declaration, paragraph 12).

I have previously had an Examiner's interview with you where I showed the physical property differences between water insoluble PAM and water soluble PAM. Attached are the exhibits which I have previously showed you. (Declaration, paragraph 13).

Exhibit 1, put out by the USDA entitled The PAMphlet states that "Designated as "water soluble", "linear" or "non-crosslinked" PAMs (Not: gel-forming, super-water absorbent, crosslinked or non-linear. These are not soluble and/or not suited for erosion control). The article goes on to further state that "The focus of the NWISRL research for the past decade has been mainly on water soluble PAM's for erosion control and infiltration management. We have gotten many questions about crosslinked PAM's, which are a different class of compounds. They are not water soluble but instead are "super water absorbant" or "gel-forming" compounds and are not used for erosion control." "The PAMs designated for this use are regarded as "water soluble" or "linear" or "non-crosslinked" PAMs. Do not purchase "crosslinked" or "super water-absorbant" PAMs for use in irrigation water. The latter do not act the same as linear PAMs in water or in the soil, and they have a different function and purpose." (Declaration, paragraph 14).

Exhibit 2 illustrates a comparison between water soluble PAM and water insoluble PAM. By using the product with water insoluble PAM, the product swells to absorb water. By using water soluble PAM, the product releases the polyacrylamide while remaining the same size. (Declaration, paragraph 15).

Exhibit 3 shows the granular fertilizer with water soluble PAM and without water soluble PAM. The one without water soluble PAM shows a segregation and a liquid. The one with water soluble PAM shows a binding and a slurry. (Declaration, paragraph 16).

Exhibit 4 shows the granular fertilizer test protocol for limestone granules. The test results showed that the limestone with water soluble PAM showed physical material characteristics that assist in reducing runoff and reduce leeching thereby enhancing the value of the limestone. Further the limestone if used as a method of metering water soluble PAM to the soil would stay where broadcast. (Declaration, paragraph 17).

Exhibit 5 shows the difference between water soluble polyacrylamide and water holding (water insoluble) polyacrylamide. (Declaration, paragraph 18).

Exhibit 6 shows the commercial application of the product of the present invention and its commercial advantages. (Declaration, paragraph 19).

Claim 1 requires that a soil stabilizer is added to a solid carrier and that when water is applied to the solid carrier, the soil stabilizer is released into the soil. The Examiner agrees that Hamilton does not teach a soil stabilizer. The Examiner states that you can modify Hamilton by using the PAM disclosed by Green. This goes against the teachings of both patents. First, Hamilton requires that the most essential feature, and the essential additive to the mulch be a water insoluble polymer. Green only describes a water soluble PAM. Green specifically focuses on the use of PAM in water or in construction. Hamilton does not teach anything regarding the use of PAM in water. Further, Green teaches to use water soluble PAM by itself and teaches against the use of a mulch which is taught by Hamilton. Further, Hamilton sites to a reference, 3,973,355 which specifically states why a water soluble polymer cannot be used instead of a water insoluble polymer. For all of these reasons, Claim 1 is not obvious over the prior art.

Further, with regards to Claim 1, Hamilton specifically teaches a blanket of mulch which is spread or broadcast over the soil. Claim 1 of the present invention requires that the soil stabilizer release out of the solid carrier and into the soil. This is not taught by the prior art references.

With regards to Claims 7, 16, 17, 25 and 62, for the reasons stated above for Claim 1, these claims are not obvious over the prior art.

As to claim 3, Hamilton as modified by Green further disclose the carrier applied by a spreader ("spread or broadcast", col. 4 lines 32-41 of Hamilton).

For the reasons stated above for Claim 1, Claim 3 is not obvious over the prior art.

As to claims 4 and 5, Hamilton as modified by Green further disclose rain ("when wetted" col. 4 lines 32-41 of Hamilton) and irrigation ("irrigated" col. 4 lines 32-41 of Hamilton).

The Examiner is incorrect when he states that Col. 4, lines 32-41 use the word "irrigated". The word is not found in the text. For the reasons stated above for Claim 1, Claims 4 and 5 are not obvious over the prior art.

As to claim 6, Hamilton as modified by Green further disclose adding fertilizer to the carrier (col. 3 lines 34-43 of Hamilton).

For the reasons stated above for Claim 1, Claim 6 is not obvious over the prior art.

As to claim 8, Hamilton as modified by Green further disclose adding seed (col. 3 lines 34-43 of Hamilton).

For the reasons stated above for Claim 1, Claim 8 is not obvious over the prior art.

As to claim 9, not disclosed is adding a herbicide. It would have been obvious to modify the method of Hamilton as modified by Green by adding a pesticide depending desired use of the mulch.

For the reasons stated above for Claim 1, Claim 9 is not obvious over the prior art.

As to claim 11, not disclosed is the stabilizer of the total weight being less than 50%. It would have been obvious to modify the method of Hamilton as modified by Green by having the stabilizer of the total weight being less than 50% depending on use of the composition.

For the reasons stated above for Claim 1, Claim 11 is not obvious over the prior art.

As to claim 12, Hamilton as modified by Green further disclose an extruded pellet (Hamilton col. 3 lines 5-22).

For the reasons stated above for Claim 1, Claim 12 is not obvious over the prior art.

As to claim 13, Hamilton as modified by Green disclose the carrier as fertilizer ("clay" of Hamilton col. 4 lines 1-3).

The Examiner has cited to Hamilton to state that clay is a fertilizer described in Hamilton. Hamilton states that clay is an undesirable filler which may be harmful to soil, seeds or plants. Therefore, Hamilton teaches away from using a fertilizer as stated by the Examiner. For these reasons and the reasons stated above for Claim 1, Claim 13 is not obvious over the prior art.

For the reasons stated above for Claim 1, Claim 14 is not obvious over the prior art.

As to claim 14, Hamilton as modified by Green disclose adding a disease causing microbe to a solid carrier ("other optional additives" col. 3 lines 35-43 of Hamilton). It would have been obvious to modify the method of Hamilton as modified by Green by adding a disease causing microbe to the carrier as disclosed by Hamilton depending on use of the carrier.

As to claims 18 and 19, Hamilton as modified by Green further disclose a solid carrier being a material from paper manufacturing ("newsprint" col. 3 lines 26-33) with a previous treated ingredient that has soil stabilizing properties ("binder material" col. 3 lines 26-33).

With regards to Claim 18, the binder material does not comprise a material that was previously treated with an ingredient that has soil stabilizer properties. For this reason and the reasons stated above for Claim 1, Claim 18 is not obvious over the prior art.

With regards to Claim 19, for the reasons stated above for Claim 18, Claim 19 is not obvious over the prior art.

As to claims 28-57, Hamilton as modified by Green further disclose those limitations as inherent when PAM is added to the soil.

For the reasons stated above for Claim 1, Claims 28-57 are not obvious over the prior art.

Further with regards to Claim 36, Green states that a mulch should not be used with regard to rilling of the soil which teaches against Hamilton.

As to claim 10, Hamilton discloses a method of applying an agent to the soil (col. 4 lines 35-41 and col. 5 lines 43-46) comprising adding the agent to the solid carrier (col. 5 lines 43-46) that are pellets (col. 4 lines 5-42); applying the soil carrier to the soil (col. 4 lines 35-41); applying water to the solid carrier ("when wetted", col. 4 lines 35-41); releasing the agent out of the carrier and into the soil ("release water" col. 4 lines 35-41); wherein application rates of the solid carrier to the soil is based on the desired amount of agent to be metered to the soil ("release any included nutrients" abstract in that mulch application would be monitored for amount of nutrient needed or applied); the soil carrier is an agglomerate (inherent in "pelletization" col. 4 lines 14-18; extrusion is a pressure agglomeration, for example 4,123,489, col. 9 lines 3-8). Not disclosed is the soil agent being a soil stabilizer. Green discloses a soil stabilizer, PAM, to the soil (abstract). It would have been obvious to modify the method of Hamilton by using PAM as the agent as disclosed by Green, so as to stabilize soil aggregation and flocculate suspended particles (Green abstract) so as to stop erosion.

For the reasons stated above for Claim 1, Claim 10 is not obvious over the prior art.

As to claims 58-60, Hamilton discloses a method of improving soil penetration, reducing soil erosion, and reducing fertilizer runoff (col. 2 lines 29-43) comprising applying a material by convention application ("spread or broadcast" col. 4 lines 32-41) to the soil (col. 4 lines 32-41 and col. 5 lines 43-46) comprising adding the material to the solid carrier (col. 5 lines 43-46) that are pellets (col. 4 lines 5-42; col. 5 lines 43-46); applying the soil carrier to the soil (col. 4 lines 35-41); applying water to the solid carrier ("when wetted" col. 4 lines 32-41); releasing the material out of the carrier and into the soil ("disintegrate when wetted" col. 4 lines 32-41); wherein the soil carrier is made by an agglomeration process, pressure ("water is extruded and lost during pelletization" col. 4 lines 14-17); wherein application rates of the solid carrier to the soil is based on the desired amount of material to be metered to the soil ("uniform incorporation of small amounts of powdered water-absorbing, gel forming polymers" col 4 lines 32-41). Not disclosed is the material being a soil stabilizer. Green discloses applying a soil stabilizer, anionic PAM, to the soil (abstract). It would have been obvious to modify the method of Hamilton by using PAM as the agent as disclosed by Green, so as to stabilize soil aggregation and flocculate suspended particles (Green abstract) so as to stop erosion.

For the reasons stated above for Claim 1, Claims 58-60 are not obvious over the prior art.

Claim 15 is rejected as being obvious over Hamilton in view of Green and further in view of Roberts, 5,725,630. Not disclosed is the soil carrier being calcium oxide. Roberts discloses the use of calcium oxide ("calcium silicate" col. 3 lines 60-68). It would have been obvious to modify the method of Horne as modified by Green by using calcium oxide the carrier as disclosed by Roberts depending on use of the composition.

For the reasons stated above for Claim 1, Claim 15 is not obvious over the prior art.

Claims 20-22 are rejected as being obvious over Hamilton in view of Green and Horne, 2,765,291.

As to claim 20, Hamilton discloses a method of applying a material to the soil (col. 4 lines 32-41 and col. 5 lines 43-46) comprising adding the material to the solid carrier (col. 5 lines 43-46) that are pellets (col. 4 lines 5-42; col. 5 lines 43-46); applying the soil carrier to the soil (col. 4 lines 35-41); applying water to the solid carrier ("when wetted" col. 4 lines 32-41); releasing the material out of the carrier and into the soil ("disintegrate when wetted" col. 4 lines 32-41); wherein the soil carrier is made by an agglomeration process, pressure ("water is extruded and lost during pelletization" col. 4 lines 14-17); wherein application rates of the solid carrier to the soil is based on the desired amount of material to be metered to the soil (uniform incorporation of small amounts of powdered water-absorbing, gel forming polymers" col. 4 lines 32-41). Not disclosed is the material being a soil stabilizer and the carrier comprised of at least 25% particles in excess of 1mm in diameter. Green discloses applying a soil stabilizer, PAM, to the soil (abstract); Horne discloses the solid carrier particles being in excess of 1 mm in diameter (3/16" of inch col. 3 lines 5-11). It would have been obvious to modify the method of Hamilton by using PAM as the agent as disclosed by Green so as to stabilize soil aggregation and flocculate suspended particles (Green abstract) so as to stop erosion and to have the particles in excess of 1mm diameters so as to allow for easier handling.

For the reasons stated above for Claim 1, Claim 20 is not obvious over the prior art.

As to claim 21, not disclosed is solid carrier containing mineral elements. Hamilton as modified by Green and Horne further disclose the carrier containing mineral elements ("nutrients" col. 3 lines 34-43 of Hamilton). It would have been obvious to modify the method of Hamilton as modified by Green and Horne by adding nutrients so as to increase desired plant growth.

For the reasons stated above for Claim 1, Claim 21 is not obvious over the prior art.

As to claim 22, Hamilton as modified by Green and Horne further disclose the stabilizer holding the mineral elements in the soil (inherent).

For the reasons stated above for Claim 1, Claim 22 is not obvious over the prior art.

Claim 61 is rejected as being obvious over Horne in view of Greene. Horne discloses a method of applying a soil additive to the soil (col. 3 lines 5-50) comprising adding a soil additive to a solid carrier (carrier is pumice, col. 1 lines 28-73); applying the solid carrier to the soil (col. 1 lines 49-55; col. 3 lines 43-49); applying water to the solid carrier (col. 3 lines 51-68); leaching the soil additive out to the solid carrier into the soil (col. 3 lines 51-68); wherein application rate of the solid carrier to the soil is based on the desired amount of the soil stabilizer to be metered to the soil (col. 1 lines 49-55, col. 2 lines 4-6); wherein the carrier is a fertilizer (pumice would contain some nutrients). Not disclosed is the soil additive being a soil stabilizer. Green discloses the addition of a soil stabilizer, PAM anionic (abstract). It would have been obvious to modify the method of Horne by adding PAM to the soil as disclosed by Green so as to stabilize soil aggregates as well as flocculate suspended particles. (Green abstract).

For the reasons stated above for Claim 1, Claim 61 is not obvious over the prior art. Further, none of the references teach that a solid carrier consists essentially of a fertilizer.

Applicant believes that the application is now in condition for allowance.

"EXPRESS MAIL" Mailing Label No. EM 024260230 US
Date of Deposit: March 5, 2008
I hereby certify that this paper (and any document(s) attached herewith Is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313 on March 5, 2008

Signature: Debbie Broderick
Name: Debbie Broderick

Respectfully submitted,
Philip Weiss
Philip M. Weiss
Reg. No. 34,751
Attorney for Applicant
Weiss & Weiss
300 Old Country Rd., Ste. 251
Mineola, NY 11501
(516) 739-1500

PMW:db

# EXHIBIT 1

# The PAMphlet:

## A concise guide for safe and practical use of polyacrylamide (PAM) for irrigation-induced erosion control and infiltration enhancement.

USDA-ARS Northwest Irrigation and Soils Research Laboratory Station Note #02-98.

*Prepared by R.E. Sojka, R.D. Lentz, D.L. Bjorneberg, and J.K. Aase, Northwest Irrigation and Soils Research Lab, USDA-Agricultural Research Service, 3793N-3600E, Kimberly, ID 83341*

Commercial use of polyacrylamide (PAM) in irrigation water began in 1995 and has been enormously successful and environmentally beneficial. Over 600,000 acres were PAM-treated in the USA in 1997. The overseas market is much larger. The USDA Natural Resources Conservation Service has recognized the Kimberly ARS development of this technology as possibly the most successful soil conservation practice ever developed for furrow irrigation. New uses for the PAM soil conservation technology are being developed at a rapid pace. This pamphlet gives practical considerations for PAM-use in furrow and sprinkler irrigation, drawing on research conducted by the Kimberly ARS team since 1991, and from other published sources.

### PAM Material Considerations:

**Purchase only polyacrylamide (PAM) officially labeled for irrigation erosion control by your state** (37 states currently have agricultural soil fertilizer and amendment laws governing product label/registration). Purchasing from known reputable agri-chemical suppliers may avoid acquiring ineffective or dangerous formulations inappropriate for this use. In the USA this restricts use to PAMs with the following properties:

- Anionic PAMs (negatively charged)-NOT CATIONIC (cationic PAMs can harm the environment). Negative charge density may vary from 2 to over 30%, but 18% is typical.
- Less than 0.05% free acrylamide monomer (AMD) by weight (<0.025% in Europe)
- Moderate to high molecular weights (typically 12 to 15 Mg/mole). Some PAMs used mainly for infiltration enhancement have lower molecular weights.
- Designated as "water soluble", "linear", or "non-crosslinked" PAMs (NOT: gel-forming, super-water absorbent, crosslinked, or non-linear. These are not soluble and/or not suited for erosion control).

**Purchase PAMs with reasonably high chemical analysis regardless of "type of formulation".** PAMs are available in a number of formulation types. The two most common forms are as dry granular beads/powders or as concentrated inverse emulsions. The dry forms of PAM should be expected to be 80% or greater active ingredient (ai) by weight. Inverse emulsions are usually either 30 or 50% ai. In rare instances PAM can be purchased as straight aqueous solutions, however viscosity limits these to 3% ai. PAM is also available as large blocks or cubes. *Remember that regardless of form or cost, the*

- .Learning About Polymers A general search for the subject of polyacrylamide "in the chemical world" at the ChemIndustry.com website. more
- Learning About Polymers Polyacrylamide (PDF file). "ACRONYM; CHEMICAL ABSTRACTS NAME AND NUMBER; PAAm; 2-propenamide homopolymer [9003-05-08]. CLASS: Vinyl polymers." more (PDF file)
- Learning About PAM POLYACRYLAMIDE MARKET 2002 "Growth in the polyacrylamide market slowed in 2001 to 2-3% compared to 6-7% for the previous year." more

## Cross-Linked Polyacrylamide Information:

**The focus of the NWISRL research for the past decade has been mainly on water soluble PAM's for erosion control and infiltration management. We have gotten many questions about crosslinked PAM's, which are a different class of compounds. They are not water soluble but instead are "super water absorbant" or "gel-forming" compounds and are not used for erosion control. We add this information for your convenience. For a bit more clarification see "The PAMphlet" on the main PAM page of the NWISRL website.**

- Landscaping Uses of Cross-linked Polyacrylamide in the Western United States. "Xeriscape-related applications for cross-linked polyacrylamide, a water-absorbing polymer with a proven lifespan of six years and the capability of absorbing up to 400 times its weight in deionized water." more
- Polyacrylamide Gel and Compost. "Polyacrylamide gel, a modern garden product that absorbs water and releases it slowly to plants' roots." more
- Influence of Polyacrylamide on Physical Properties of a Peat-perlite Mix and on the Growth of *Argyranthemum coronopifolium*.
- Canadian Cross Linked PAM Research Forage Establishment Using Polyacrylamide Gel. "Adding dry polyacrylamide gel in two different sizes with alfalfa and Russian wildrye has not benefitted establishment on either sandy loam or clay-loam soils." more
- Cross Linked PAM Report Polyacrylamide found to reduce soil erosion in furrows by up to 99 percent. "...PAM alone or in combination with HYDROGEL, a cross-linked polyacrylamide, has substantially increased yields in corn, onions, tomatoes, and peppers." more
- Cross Linked PAM Used for Sealing Polyacrylamide Gels for Water Shutoff in Fractured-Granite Basement Reservoirs. "A variety of polyacrylamide compounds with inorganic and organic crosslinking agents were tested for stability at high temperatures. The effects of temperature, polymers, crosslinkers, brine salinity, and pH on gelation and stability were studied." more
- Jellyfish Contact Lenses Slices of jellyfish infused with your cornea! "Soft contact lenses are made of crosslinked polyacrylamide, which actually absorbs water, (will not dissolve) so it's a good material for contact lenses. OK, so if you take your soft contact lens and play with it, you'll notice that this polyacrylamide feels very similar to jellyfish flesh." more

page.

- diapers
- gel ice
- fire fighting
- municipal water treatment
- toothpaste
- and cosmetics.

We're going to preface this next, very important question & answer by stating that we defer to the experts in the field and the fine people at the USDA ARS Soil and Water Management division who have dedicated years of research to improving our understanding of how to benefit ourselves without adversely affecting both terrestrial and riparian ecosystems. Farmers and those with like concerns with should be familiar with the current NRCS application standard (anonymous) 1995.

The following answer's data (subsets 1. - 4.) were taken from the final comments, subtitled "Important User Considerations", found in University of Idaho Publication No. 101-96, "A PAM Primer: A Brief History of PAM and PAM-Related Issues". Sojka, R.E. and Lentz, R.D., 1996. Our added comments are in blue and have only been added for clarification for those that are unfamiliar with the report.

**Q: Can I use any type of water absorbing polymer for my plants?**
**A:**No.

What you are looking for is a polymer called PAM (polyacrylamide). Be aware that, although all PAMs are polymers, **NOT ALL POLYMERS ARE PAM.** The media's recent high interest in PAM and the many stories reporting the effectiveness of PAM have often referred to the PAM only as "polymer" or as "the polymer." This has encouraged some entrepreneurial exploitation of the word "polymer" in the agricultural community. The results achieved with the specific class of PAMs designed for irrigation are not known to be achievable with other affordable chemical polymers.

1. If you are a commercial operation, purchase only polyacrylamide (PAM) labeled for this use by your state (if registration and labeling are required). Purchasing from known reputable agricultural chemical suppliers may avoid acquiring ineffective or dangerous formulations inappropriate for this use. If the supplier if unknown to you, is new in the business, or is doing business over the internet (a-hem!), request an analytical MSDS sheet to review the composition (and keep it on file).

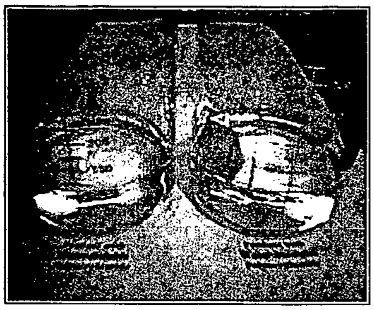
2. By law, irrigation PAMs should contain no more than 0.05% free acrylamide monomer (AMD) by weight (in Europe, no more than 0.025%). The specific PAM copolymer formulation should be anionic **(NOT cationic)**. The charge density may vary from 8-30 %; a value of 18% is typical. Molecular weight can vary, but higher molecular weights are usually more effective than lower for equal amounts of material applied and result in less AMD application for equal erosion control. Recent literature suggests that molecular weights of 12-15 Mg/mole are optimal.

3. The PAMs designated for this use are regarded as "water soluble" or "linear" or "non-crosslinked" PAMs. **Do not purchase "crosslinked" or "super water-absorbent" PAMs for use in irrigation water.** The latter do not act the same as linear PAMs in water or in the soil, and they have a different function and purpose.

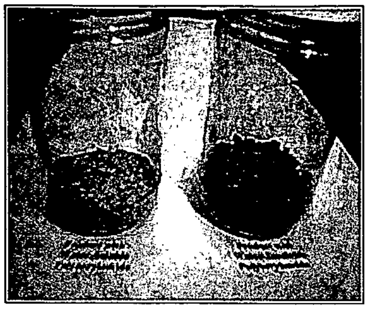
4. The PAM you purchase should have a reasonably high analysis. PAMs purchased as dry "granular," "bead" or "powder" from reputable chemical companies will usually contain 80% or higher active

EXHIBIT 2

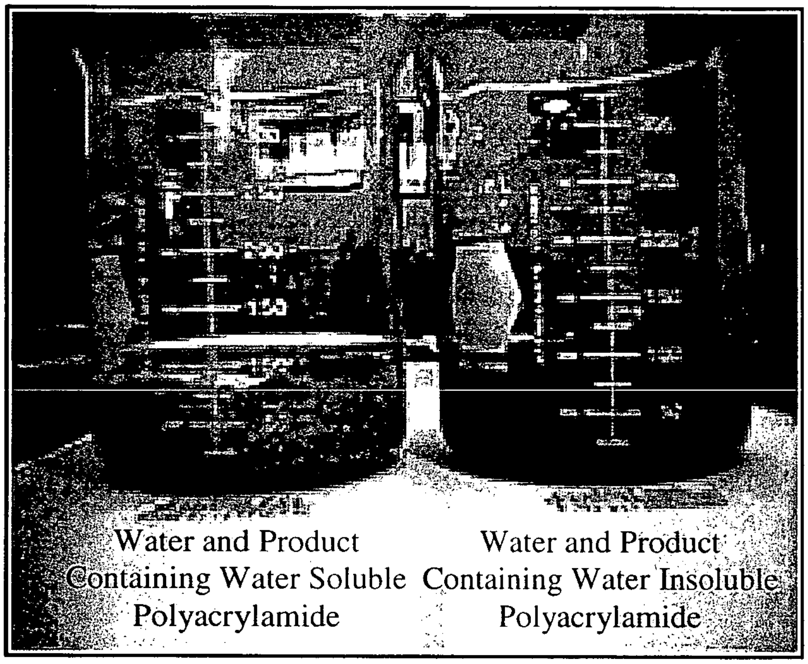
# Technology Comparison
# New vs. Current Technology



100ml of water per
sample



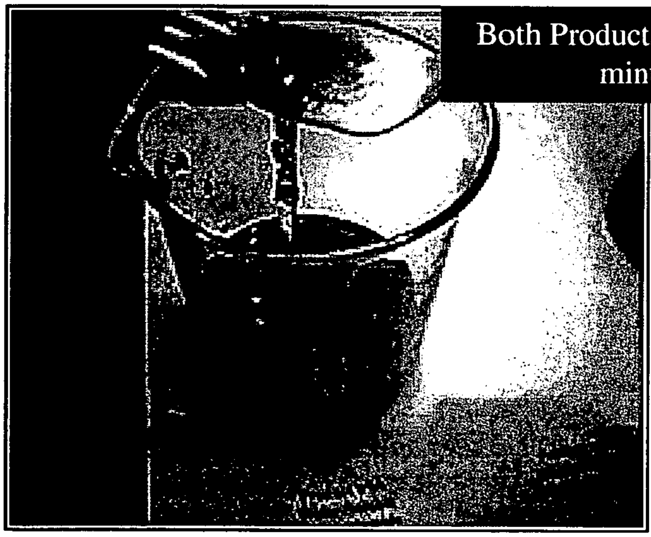
15 grams per
Product



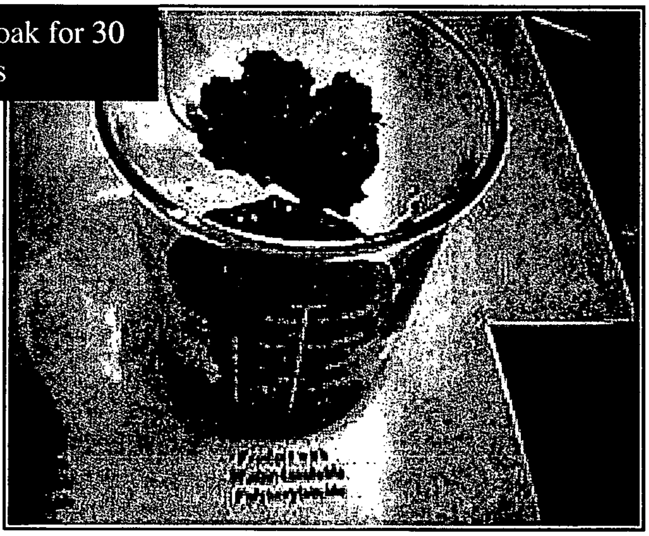
Water and Product Containing Water Soluble Polyacrylamide

Water and Product Containing Water Insoluble Polyacrylamide

Both Products Soak for 30 minutes



Product releases polyacrylamide while remaining same size

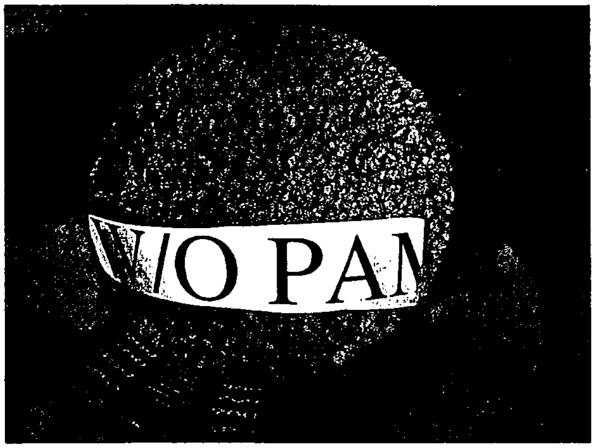


Product swells to absorb water.

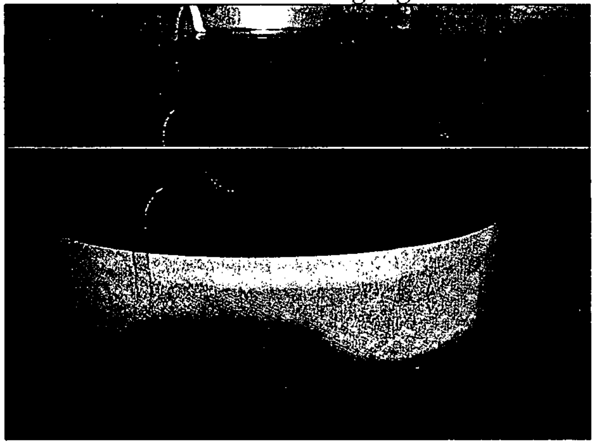
EXHIBIT 3

# Granular Fertilizer
# With Limestone and WSPAM

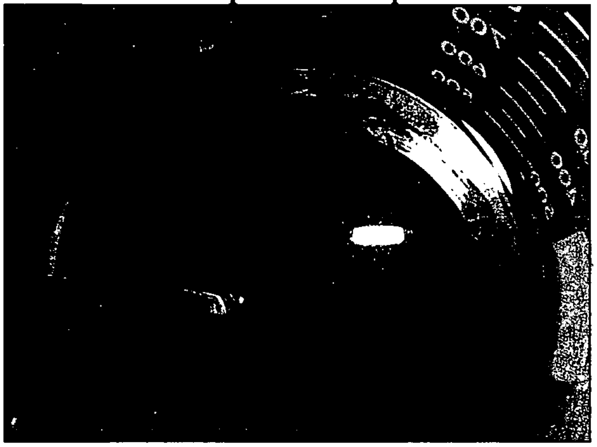
Dry Conventional Limestone
(without WSPAM)



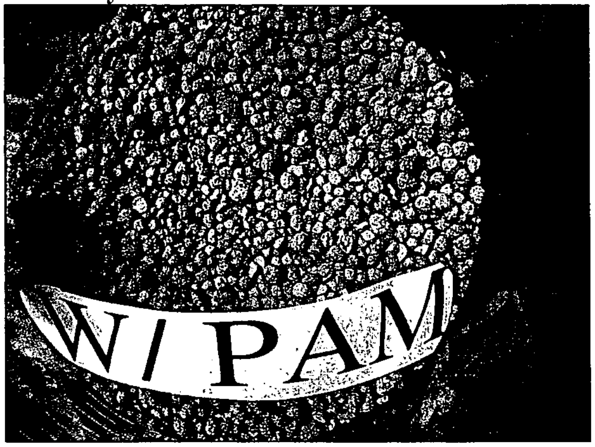
Side View - Segregation



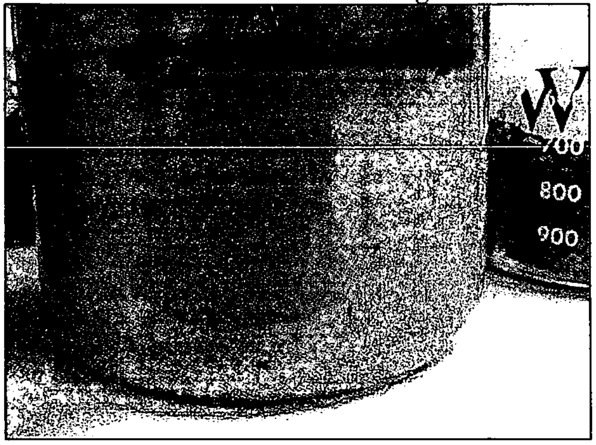
Top View - Liquid



Dry Limestone with WSPAM



Side View - Binding



Top View - Slurry

**EXHIBIT 4**

# Granular Fertilizer
# Test Protocol
# For Limestone Granules

## Composition

Limestone granulation tests were conducted to demonstrate the ability to granulate limestone and water-soluble polyacrylamide (WSPAM) into a new Granular Fertilizer. The limestone granules would be measured for hardness, solubility when wet, abrasion, and size to meet typical specifications.

The limestone test was run at the FEECO International lab facility utilizing a bag unloader to process. The process included weighing the material, adding moisture in a FEECO Pin Mixer and then transferring the prewetted micro granules to a 4'6" Pan pelletizer for final granulation. A lignin binder was used. The granules were dried in a FEECO International Rotary dryer, and screened for product size. The on size product was bagged. The oversize product was crushed in a FEECO International chain mill and returned to process along with the undersized in a recycle loop. The product passed all tests for hardness, size, solubility, and abrasion.

A second test was run using the identical process as the traditional limestone test except included the addition of 2% dry WSPAM (by weight) to the limestone. The product passed all tests for hardness, size, solubility, and abrasion. The process ran smoother with more on size and slightly higher quality pellets with the WSPAM added.

## Performance

There were differences however between the two tests. The two products while identical looking in a dry pellet form where not at all the same when moisture was added. One pound of water and one pound of material where added to the beaker. The traditional limestone fertilizer when wetted broke apart back into the original fines that were sent to process. The limestone absorbed very little moisture. When stirred the limestone would become suspended in the water and the color of the beaker would turn from the black (lignin) look to the brown murky look. If poured after stirring 100% of the fines would have poured out of the beaker. This test would simulate a heavy rain on a slope and the loss of fertilizer into creeks and stream. The same test was conducted with the limestone fertilizer with WSPAM. The limestone turned into a cake batter consistency. No individual limestone fines were observed. Another ½ pound of water was then stirred in and again and no free water was observed.

## Conclusion

Traditional fertilizers when soluble carry fines in solution to the roots but also leech through the soils and runoff the soils into creeks and streams. The limestone granular fertilizer exhibited similar characteristics to traditional fertilizers. The limestone with WSPAM showed physical material characteristics that would assist in reducing runoff and reduce leeching thereby enhancing the value of the limestone. In addition, it appeared that if limestone was used as a method of metering WSPAM to the soil that the limestone would stay where broadcast.

# EXHIBIT 5

# Water Soluble Polyacrylamide

# Water Holding, Super-absorbent Polymer

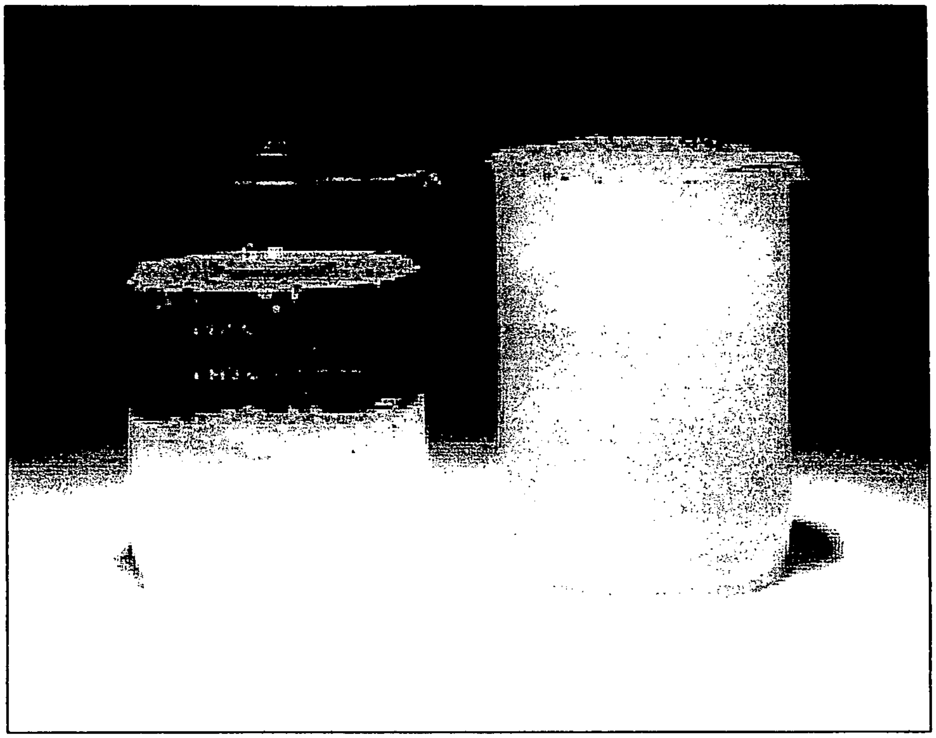
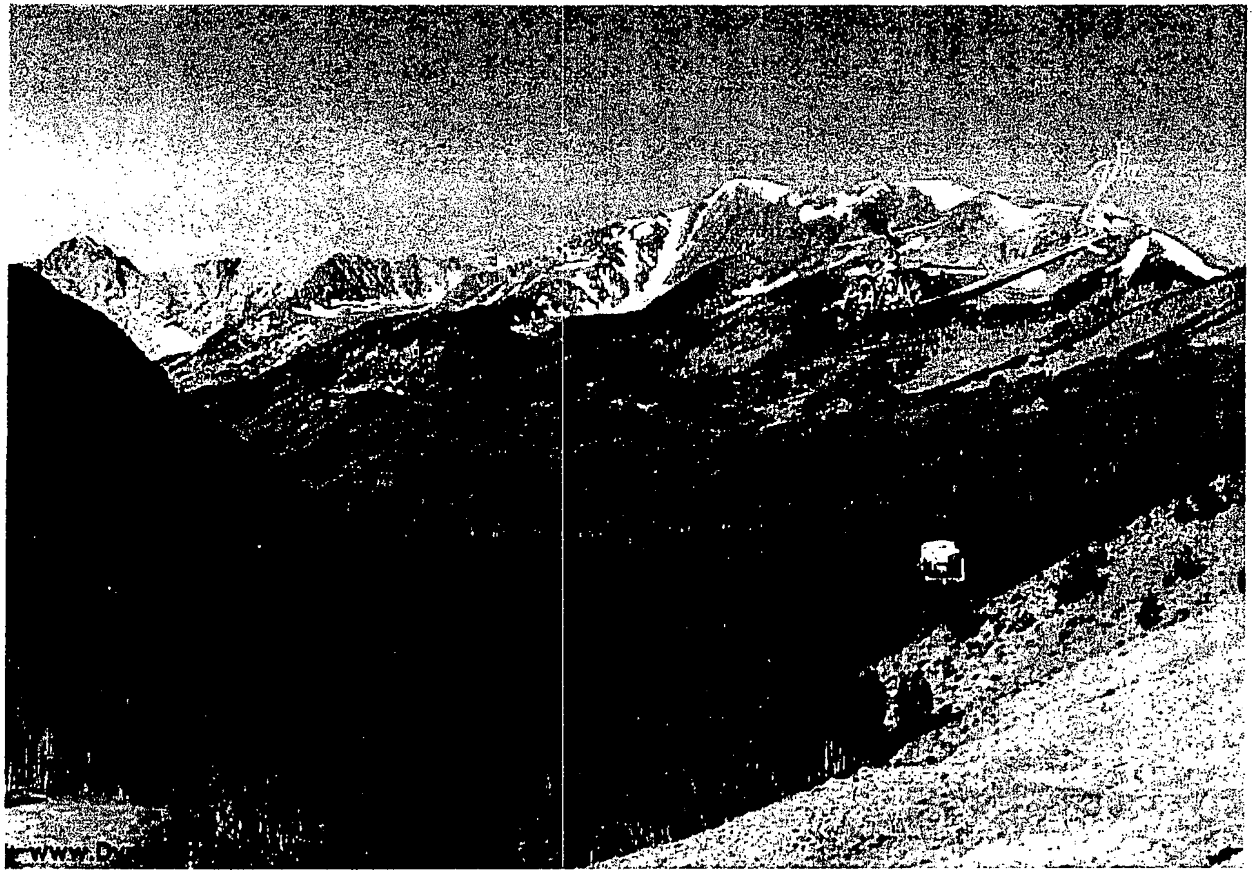


EXHIBIT 6

# PAM-12 Market Segments

## Forestry

## Burned Area Emergency Rehabilitation

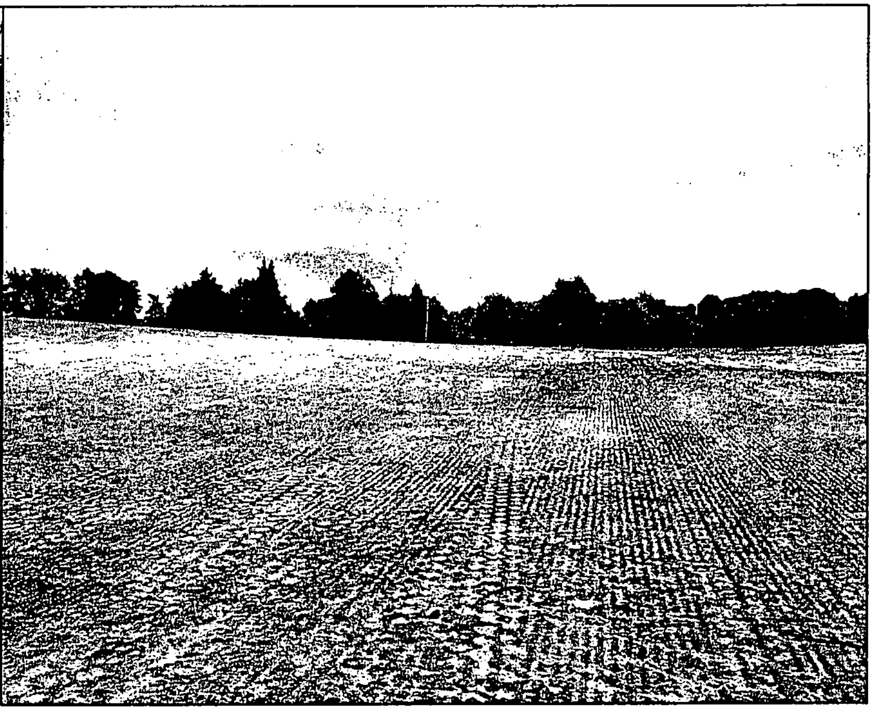


Aerial Application of PAM-12 in Utah

# PAM-12 Market Segments

## Department of Transportation

Loading PAM-12



PAM-12 Spread on project

# The Problem...

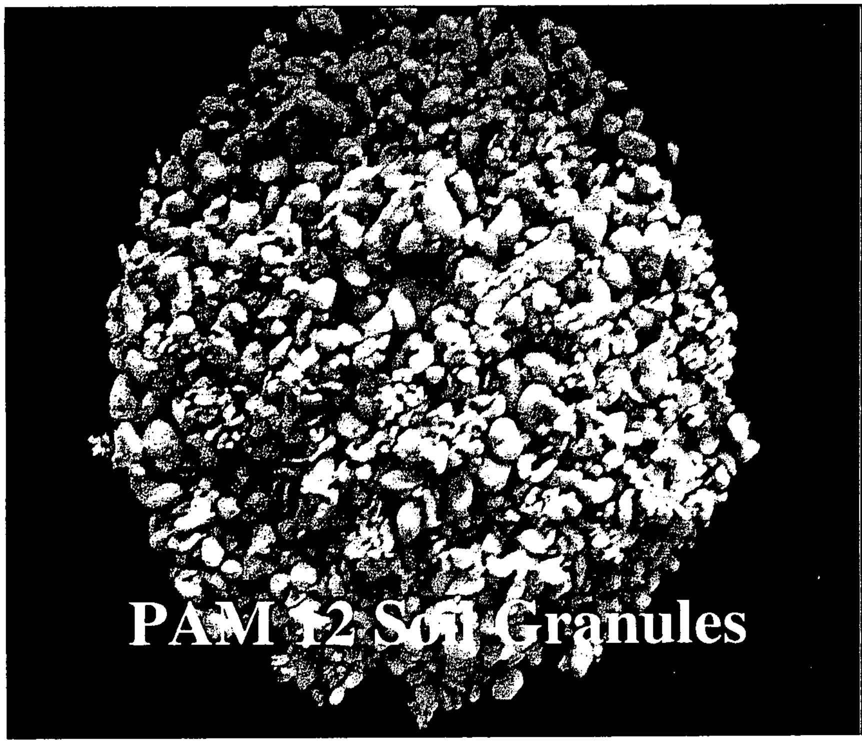
PAM is very difficult to handle and spread in it's dry powder form.

# How has PAM been Applied?

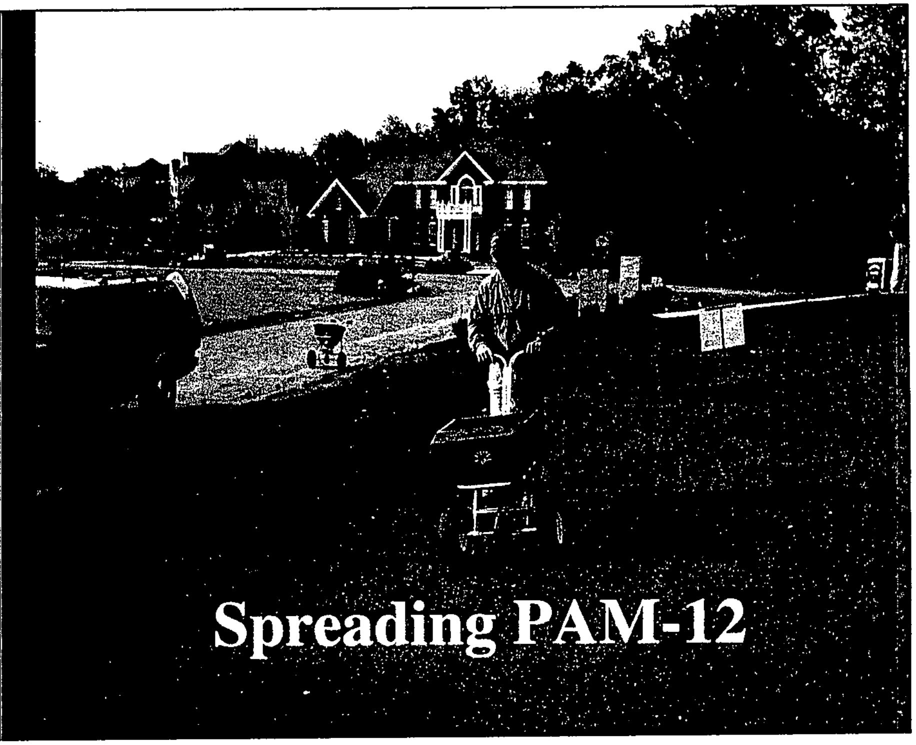
- In the past, this has made it difficult to apply without first dissolving in water.

# The Solution...

Encap ‘PAM-12 granules’ has made spreading PAM easy



PAM 12 Soil Granules



Spreading PAM-12

PAM-12 granules carry WSPAM to the soil surface where it is released with each irrigation and rainfall.

# Flows through a Spreader